

Appl. No. 09/928717
Amdt. dated February 28, 2007
Reply to Office Action of Nov. 30, 2006

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Remarks/Arguments

1. **Amendments to the Claims:** Claim 32 has been amended to incorporate the subject matter of claims 34, 37 and 38. Claims 34, 37 and 38 were cancelled.
2. New claims 51 – 60 were added. Claim 51 is based on the previously filed version of claim 32, and includes the additional limitation of defining the cone as a right circular cone. Claim 60 is based on currently filed claim 32 and includes the further limitation that each single element has a cone wall, cone base, and vertex. The right circular cone is shown in FIGS. 4 and 5 and its fabrication, which inherently describes a right circular cone, is described in paragraphs [0017] in the Specification as originally filed. Claims 52 – 59 depend from claim 51 and are based on essentially previously filed claims 33 – 38 and 42 – 47. Claim 60 is an independent claim.
3. The amendments to the claims introduce no new subject matter and Applicant respectfully requests approval and entry of the currently presented claims 32 – 36, 42 – 47, and 51 – 60.
4. **Examiner's Response to Arguments:** See Office Action, pages 6, 7. Examiner asserts, among other things, that "Fuller figure 11 by itself shows a conical structure (Webster's dictionary → cone: a closed plane base and the surface formed by line segments joining every point of the boundary of the base to a common vertex). The structure of figure 11 thus meet the definition of conical element as claimed."
5. Claim 32 of the present application does not recite a cone having a surface formed by line segments, but rather, "a conical element having a cone base, a cone wall and a vertex, said cone wall defined by straight lines that extend from said base and intersect each other at said vertex." FIG. 11 shows an arrangement of diamond-shaped

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elements, which Examiner asserts is a cone, which, therefore, must have a "closed plane base." FIG. 11 comprises diamond-shaped elements 3', which are outwardly convex panels, the convexity formed by a fold across the short axis, and diamond-shaped elements 4, which are outwardly concave elements, the concavity formed by a fold along the long axis (see shading). Applicant notes first that the surface of these elements is not formed by straight lines, but rather, line segments that together form a bent line, i.e., a line that is not straight. Exhibit A is attached to this paper and shows the Fuller FIG. 11. Lines L1 and L2 have been drawn in for purposes of discussion. Each of the Fuller diamond-shaped elements, regardless of the type of element (3, 3', 4, or 4') or in which figure it is shown, has an extending flap along its four sides. See FIG. 3 and col. 5, lines 2 – 5. The diamond-shaped elements 3' have a fold across the short axis designated **FSA** and the diamond-shaped elements 4 have a fold along the long axis designated **FLA**. First line **L1** is drawn from the vertex to a point on the base of the element 3' and has three line segments AB, BC, and CD, each of which lies in a different plane from the other line segments. In other words, neither the first line **L1**, nor any line extending from the vertex to the base in the diamond-shaped elements 3', is a straight line.

6. The second line **L2** is drawn on the diamond-shaped element 4, from the vertex to a point on the base. This is the only line on this element that is a straight line extending from the base to the vertex. Thus, Fuller does not disclose the limitation of claim 32 of a conical element having a cone wall formed by straight lines that extend from the cone base and intersect each other at the vertex.

7. The Fuller structure in FIG. 11 (and in FIG. 10) is not a conical element as claimed in claim 32 of the present application, because the conical element does not

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comprise a cone wall formed by straight lines that extend from the cone base to the vertex.

8. Furthermore, the structure shown in FIG. 11 is not a conical structure, because it does not and cannot have a closed plane base. The diamond-shaped element 3' has a concave fold at the fold line **F_{SA}**, to create the concave surface; the diamond-shaped 4 has a convex fold at the fold line **F_{LA}**. This structure cannot have a closed plane base, because of the folds in the diamond-shaped elements 4 and also in 3'. If the structure shown in FIG. 11 were a cone, then all points on the cone base would have to lie in a single plane. This is not the case, as shown in the small sketch provided beneath FIG. 11 in Exhibit. The same argument applies to FIG. 10.

9. Applicant notes that the arrangement of elements 4' and 3' shown in FIG. 9 comprises diamond-shaped elements, each of which has a fold across the short axis, so as to form an outwardly convex element. This arrangement could be interpreted to have a closed plane base only if the diamond-shape of the Fuller elements are truncated into triangular elements. This is, however, not what Fuller teaches or discloses.

10. Applicant refers now to the dome structures of Fuller, in which he shows arrangements of the diamond-shaped elements: FIGS. 12, 13, 14, 15, 16, and 17. In not one of these structures does Fuller use the structures disclosed in FIGS. 9 – 11, each of which was constructed with an alternating arrangement of the two types of diamond-shaped elements 3 or 3' and 4 or 4', with at least one of the types having a fold across its short axis. Rather, the diamond-shaped elements used in the dome structures have folds along long axes only. Applicant attaches Exhibit B, which has sheets B1 – B4. Fuller FIG. 14 shown on sheet B1 shows two different arrangements of

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elements, A, outlined in heavy lines, showing an arrangement of five diamond-shaped elements (3) and B, outlined with long-dash lines, showing an arrangement of six diamond-shaped elements (3 and 4). Applicant notes that each and every diamond-shaped element has a fold along its long axis. Thus, these arrangements cannot be considered "cones", since they cannot possibly have a "closed plane base." Sheets B2 and B3 show the domes structures of FIGS. 15 and 16, also showing a fold only along long axes. Sheet B4 illustrates the weaving concept. In the FIGS. 17 and 20 – 26 lines are shown along the short axes. FIG. 18 is included to show that the lines along the short axes are cord lines and not fold lines. The fold lines of the diamond-shaped elements are along the long axis, as shown in the cut-out section in FIG. 18. Structures made up of diamond-shaped elements that share a common vertex and have a fold line along the long axis cannot be a cone with a closed plane surface. Thus, these figures further support the argument that Fuller does not disclose or teach the construction of a geodesic structure with conical elements.

11. Applicant submits that Fuller does not disclose the use of cones in his structures and requests that Examiner reconsider his dismissal of Applicants arguments.

12. **35 U.S.C. § 102(b) Rejections:** Examiner rejected claim 32 as anticipated by Berg-Fernstrum (5340349). The amended claim 32 recites a plurality of conical elements that form a shell about an inner volume, with the vertex of at least one cone pointing outward away from the inner volume.

13. Berg-Fernstrum, which shows an arrangement of cones, the vertexes of each and every cone pointing toward a central point. If a complete sphere of cones were arranged according to Berg-Fernstrum, each vertex would be pointing inward to the

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center of an inner volume. Applicant submits that claim 32 as currently presented is not anticipated by Berg-Fernstrum and requests that Examiner withdraw this rejection.

14. Examiner rejected claims 32 and 42 – 47 as being anticipated by **Fuller (3203144)**, asserting that Fuller shows a structure comprising a plurality of conical elements, this assertion based on Examiner's definition from Webster's Dictionary of a cone as recited above ("having a closed plane base and the surface formed by line segments joining every point of the boundary of the base to a common vertex (where the walls 3 meet at the tip)") and relying on the elements shown in FIGS. 3 - 11. Applicant submits that the diamond-shaped elements shown in FIGS. 3 – 11 are not conical elements. Please see the section above, discussing Examiner's response to arguments.

15. Examiner further asserts that the Fuller disclosure shows a plurality of conical elements arranged to form a shell, such that at least one straight line of the Fuller cone wall extends substantially parallel to at least one straight line in the cone wall of an adjacent conical element and specifically refers to "(figure 6 shows the walls 4 and 3 being parallel, the ones on the opposite side of the vertex) so as to form a straight strut" between the vertexes of adjacent conical elements. Office Action, page 3.

16. Currently amended claim 32 recites an arrangement of the plurality of conical elements, "such that at least one straight line of said cone wall of a first conical element extends substantially parallel to at least one straight line in said cone wall of an adjacent conical element so as to form together a straight strut between said vertex of said first conical element and said vertex of said adjacent conical element, ..." Thus, a straight strut is formed by parallel straight lines of two adjacent conical elements, the straight strut thus formed extending between the vertexes of two adjacent conical elements.

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Because the straight strut is formed by the straight lines of two adjacent conical elements, the strut had previously not existed before the adjacent conical elements are brought together. The Fuller diamond-shaped elements all contain a strut in the element itself, the struts being the extending flaps of the diamond or the fold along the axis.

17. Referring now to Examiner's rejection based on Fuller FIG. 6, walls 4 and 3: the parallel lines in the Fuller arrangement of flat panels do not form a straight strut that extends between the vertexes of two adjacent cones. Applicant notes that Examiner's use of the word "vertex" with reference to the fold lines in Fuller elements 3 and 4 is whimsical, because, the point "where the walls 3 meet at the tip" does not, in fact, represent a common vertex, but rather, shows a fold line in a single diamond-shaped element, which in itself has no vertex. The elements 3 and 4, as shown in FIG. 6, do not present a cone according to the Examiner's definition (a closed plane base and the surface formed by line segments joining every point of the boundary of the base to a common vertex), but rather, are simply an overlapping arrangement of a series of adjacent diamond-shaped elements. The particular arrangement shown in FIG. 6 does not make up any kind of cone, but instead, is an overlapping arrangement of panels that, in a completed arrangement, would disclose a wavy circle that is the circumference of some chordal module of a sphere, such as the lines designated in FIG. 1 as "3/8" and "5/8".

18. Examiner further asserts that the Fuller elements are "arranged such that a distance and a direction of displacement between any two cone vertexes of adjacently placed conical elements [are] infinitely variable between a minimum and a maximum limit, ..." Office Action, page 3. In the discussion that follows, it will be helpful to keep

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in mind the underlying concept of the invention of the present application. One of the major advantages of the dome constructed with the conical elements according to the present invention is that it allows for construction of an enclosed dome surface with a very wide range of variability in its construction. This enables construction of such a dome in the field, with only those very simple tools needed for fastening the elements together, without requiring the use of calculators and precision measuring tools. See paragraphs [0018] and [0022], and [0028].

19. Currently amended claim 32 defines the maximum and minimum limits in terms of two combined cone-wall lengths that form a straight strut. Fuller does not disclose a straight strut between adjacent vertexes that has an adjustability that ranges between the minimum and maximum limits as defined in claim 32. Assuming just for the sake of discussion, that the side edges of two adjacent Fuller elements that are overlapped form a straight strut between the vertexes of the two adjacent elements, the length of the side edge of one of the elements would be the "cone wall length" length recited in claim 32. Because of the way the Fuller elements are attached to each other, the length of the side edge defines the maximum and minimum limits. It is not possible with the Fuller structure to vary the adjustability any distance greater than one side-wall length of a single side edge. In order to approximate the maximum limit as defined in claim 32, two adjacent Fuller elements would have to be arranged such that the extension flaps 8 overlapped only slightly, with the second one offset so that the flap extends in essentially the same plane and orientation as the first one. These elements are folded, meaning that the outer edges are at a very different plane than the fold line. They cannot slide over one another without lifting the connecting edge of one element away from the plane of the connecting edge of an adjacent element. Shifting one or more elements out of place, any distance beyond the side-edge length, which is much less

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than the maximum limits allowable by the structure of the present invention, would result in adjacent elements that cannot connect to each other.

20. The diamond-shaped elements must be attached to each other at the extension flaps 8, within a narrow range of tolerance, otherwise an integral structure cannot be assembled. See Fuller, col. 8, lines 23 – 50 and FIG. 19. FIG. 19 shows chord lines AB, BB, BC, etc. Col. 8, lines 23 – 50 describe the precision with which the diamond-shaped elements must be manufactured and arranged, in order to create the dome. Applicant notes that the multiplication (chord) factor for the panels is calculated with an accuracy of five (5) decimal points. This reflects an extremely high degree of precision. Not only that, the sixteen triangular sections shown in FIG. 19 are actually sections of diamond-shaped panels, but each triangular section of one panel is sized differently than the other triangular section. As a result, the flat panels have to be matched very carefully. For example, a diamond-shaped element with an edge BD has to be matched with another element with edge BD, whereby the first element with edge BD will have an edge DD extending from its edge BD, and the other element will have an edge CD extending from its edge BD. These panels cannot be overlapped with any degree of variability beyond that which is allowed with the specially constructed overlap edge (extending flap), otherwise, because of the differing orientation of the adjacent planes, the diamond-shaped elements would not fit up against each other. In other words, the assembly of the Fuller structure, because of the planar diamond-shaped elements, the difference in dimensions of the elements, based on where in the sphere they are located, and the narrow attachment edges of the elements, requires that the elements be assembled very precisely.

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21. Applicant submits that Fuller does not anticipate the invention claimed in claim 32, because Fuller does not disclose the use of cone elements having a closed plane base and a cone wall formed by straight lines from the cone base to the vertex. Fuller also does not disclose a conical element that allows a dome to be constructed with a very wide range of variability in the construction. Applicant therefore requests that Examiner withdraw his rejection of claims 32 and 42 – 47.

22. **35 U.S.C. § 103(a) Rejections:** Examiner rejected claim 42 as being unpatentable over **Berg-Fernstrum**. Office Action, page 4, section 5. Applicant notes that claim 42 depends from claim 32 and, thus, includes all the limitations of that claim. Currently amended claim 32 is clearly distinguishable over Berg-Fernstrum and Applicant requests that Examiner withdraw this rejection.

23. Examiner rejected claims 32 – 38 as being unpatentable over Chamberlain (4270320) in view of Fuller, asserting that Chamberlain does not disclose conical elements, but that Fuller discloses overlapping conical elements forming the geodesic structure. Office Action pages 4 – 6, section 6. Examiner asserts that it would have been obvious to a person of ordinary skill to modify Chamberlain's structure to show the conical elements as taught by Fuller because the conical elements enable the formation of a decorative dome shape structure as taught by Fuller." The combination of these disclosures has to teach or motivate one of ordinary skill in the art, to come up with the structure of the current application. Chamberlain discloses an arrangement of partial spherical elements, to form a hemispherical structure. Fuller discloses an arrangement of diamond-shaped, folded elements, to form a geodesic dome. The geodesic structure has long had an engineering appeal, in that flat panels are used, which reduces the cost of manufacturing of the panels, but such structures have generally required a rigid, very

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carefully and precisely constructed frame to support the flat panels, and a very precise dimensioning of the various panels. Persons skilled in the art of geodesic domes have long understood that the triangular or diamond-shaped elements used to construct the dome must be laid out in a very precise pattern and orientation and that the triangular panels themselves have to be dimensioned slightly differently, that is, according to "chord factors", in order to create the geodesic shape.

24. A person of ordinary skill in the art, looking at Fuller and then looking at Chamberlain, would not have been motivated to use the conical elements of the present application. Chamberlain does not teach the use of conical elements, nor does Fuller. The combination of Chamberlain and Fuller teaches away from the use of conical elements to construct a dome-like structure. Chamberlain teaches the use of partial spherical elements; Fuller teaches the use of planar elements and quite pointedly teaches away from the use of cones, in that he used essentially planar triangular elements by folding a diamond-shaped element to form two triangles. He did not use, or teach, or suggest the use of a conical element having a closed plane base and cone walls formed by straight lines in the construction of his geodesic dome. He did not disclose or teach the use of the elements disclosed in FIGS. 9 – 11 for the construction of the domes. Instead, he relied only upon the use of diamond-shaped elements, each having a single fold along the axis extending directly from a vertex. The arrangements of the diamond-shaped elements used in the domes do not form cones having a closed plane base and cone walls formed by straight lines that extend from the cone base through the vertex.

25. Applicant submits that the disclosures of Chamberlain and Fuller, either alone or in combination, do not teach, suggest, or motivate one skilled in the art to use conical

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elements of the present invention to construct the geodesic structure as claimed in claims 32, 51, and 60 of the present application. Applicant requests that Examiner withdraw the rejections under 35 U.S.C. § 103(a) and allow all claims currently presented.

26. **Summary:** Claim 32 has been amended, claims 34, 37 and 38 cancelled, and claims 51 – 60 added. Claims 51 and 60 are independent claims. Applicant has successfully traversed each and every rejection raised by Examiner and submits that the claims currently presented are in condition for allowance. Applicant requests that Examiner withdraw all rejections and allow all claims.

27. The total number of claims is now 20, with three independent claims, thus no additional fees are due for the new claims.

28. This amendment is being filed within the shortened statutory period of the Office Action, thus no time extension fees are due.

Respectfully submitted,



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Enclosed:
Exhibits A and B